

# PATENT ABSTRACTS OF JAPAN

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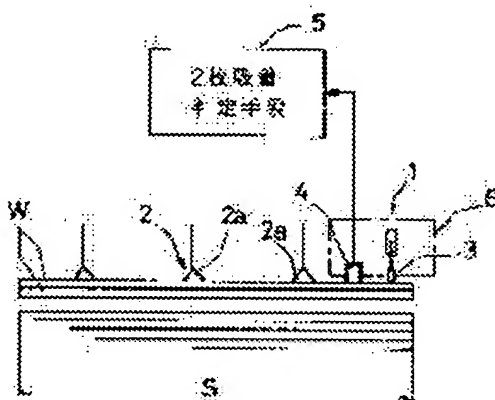
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## (54) TWO PLATE DETECTING DEVICE FOR PLATE MATERIAL

(57)Abstract:

PURPOSE: To allow detection without a damage problem due to the dropping of plate material and by only slightly lifting the plate material from a loaded place.

CONSTITUTION: A two plate detecting device is provided with a shaker 3 for providing vibration by keeping contact from the upper face with plate material W lifted by means of a suction device 2, and a vibration measuring head 4 for receiving vibration by keeping contact from the upper face with the plate material W at a place different from its contact position. The vibration measured value from the vibration measuring head 4 is inputted to a two-pieces suction judging means 5 comprising an arithmetic means. Two-piece suction judging is done from a difference between characteristic frequency of one piece and a plurality of pieces.



## LEGAL STATUS

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## CLAIMS

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[Claim(s)]

[Claim 1] Two-sheet detection equipment of the plate equipped with the vibration exciter which contacts the plate raised with the absorber from a top face, and gives vibration, and the vibration measurement child who contacts said plate from a top face in a different part from said contact location, and receives said vibration.

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention separates one plate of a laminating condition at a time, and relates to the two-sheet detection equipment of the plate applied to the loader carried in to the plate processing machine of a punch press or others.

[0002]

[Description of the Prior Art] When separating at a time one plate by which the laminating was carried out to the stock location in automatic production systems, such as sheet-metal-work Rhine, and carrying in to a plate processing machine conventionally, the loader of an adsorption equation is used. In this loader, it conveys by adsorbing the top plate one by one with an adsorption pad, and raising. However, since the oil etc. has adhered to the front face for surface treatment or plates are carrying out field contact densely mutually, in case the plate by which the laminating was carried out raises the top plate with an adsorption pad, it may be raised to [ both ] the plate under it. If even a plate processing machine conveys the plate of such a lap condition as it is, it will be in the middle of conveyance, and it not only causes the trouble on processing, but will produce the trouble of a plate falling.

[0003] Therefore, conventionally, two-sheet detection equipment is installed in a stock location, and detecting the number of sheets of the plate raised with the loader is performed. As this kind of two-sheet detection equipment, what is generally shown in drawing 3 is used. According to this, the raised plate W is clamped and put by the air cylinder 51 and the bottom clamp 52, thickness is measured with an analog sensor (not shown), and it judges whether they are being [ it / proper one sheet adsorption ] two adsorbed states as compared with the set point.

[0004]

[Problem(s) to be Solved by the Invention] However, in the thing of the configuration of drawing 3, as shown in this drawing (B), when the lower plate W falls at the time of the clamp of Plate W, a fall impact may act on the arm section 53 of the bottom clamp 52, and the arm section 53 may be damaged. Moreover, in what uses the bottom clamp 52 in this way, if Plate W is not raised to the height which can insert the bottom clamp 52, measurement cannot be started, and the cycle time does not become long. Furthermore, problems, like the fall height of the plate W at the time of two-sheet adsorption becomes high are also produced.

[0005] The purpose of this invention is offering the two-sheet detection equipment of a plate with which there being no problem of breakage by fall of a plate, and having raised the plate's slightly from the loading location can also detect.

[0006]

[Means for Solving the Problem] The two-sheet detection equipment of the plate of this invention is equipped with the vibration exciter which contacts the plate raised with the adsorber from a top face, and gives vibration, and the vibration measurement child who contacts said plate from a top face in a different part from said contact location, and receives said vibration.

[0007]

[Function] By measuring vibration given to the plate by vibration exciter by the vibration measurement child, whether two or more it is whether the number of plates is one can distinguish with the difference of a resonant frequency. That is, two-sheet detection can be performed by becoming the value from which the amplitude and vibration frequency of vibration differed, and comparing this with the set point according to the difference of the resonant frequency of the vibration system of the adsorbed plate. Since each of vibration exciters and vibration measurement children makes the top face of a plate contact, even if a lower plate falls in two-sheet adsorption, they can detect only by injuring neither vibration exciter nor a vibration measurement child, and raising a plate slightly.

[0008]

[Example] One example of this invention is explained based on drawing 1. This two-sheet detection equipment 1 forms the vibration exciter 3 which contacts the plate W raised with the adsorber 2 from a top face, and gives vibration, and the vibration measurement child 4 who contacts Plate W from a top face in a different part from that contact location. vibration exciter 3 -- for example, electromagnetism -- a solenoid, the ultrasonic vibrator by the hydrostatic pressure cylinder and the piezoelectric device, etc. can be used. The vibration measurement child 4 can use the microphone which can measure the frequency range according to an excitation frequency.

[0009] The vibration measurement child's 4 measurement output is inputted into the two-sheet adsorption judging means 5. The two-sheet adsorption judging means 5 is an operation means for predetermined operation expression to compare the resonant frequency and vibration measurement value which were taught beforehand, and to judge two-sheet adsorption. The two-sheet adsorption judging means 5 may be an arithmetic circuit which calculates a vibration measurement value with an analog value, and may be an arithmetic circuit, a microcomputer, etc. which are calculated by changing into digital value. It installs in the movable base 6 where vibration exciter 3 and the vibration measurement child 4 are common, and penetration recession is enabled with the movable base 6 to the plate \*\*\*\* raising path by the adsorber 2. An adsorber 2 prepares much vacuum adsorption pad 2a in a rise-and-fall frame.

[0010] Actuation of the above-mentioned configuration is explained. The laminating location W of the loading location S adsorbs the top thing with an adsorber 2, and is raised by rise of an adsorber 2. If Plate W goes up a little, while fluttering the vibration exciter 3 and the vibration measurement child 4 of two-sheet detection equipment 1, contacting them on the top face of Plate W and adding vibration to the plate W by vibration exciter 3, vibration of Plate W is measured by the vibration measurement child 4. A vibration measurement value is inputted into the two-sheet adsorption judging means 5, and the quality judging of adsorption is performed by the difference of the resonant frequency of one sheet or two or more sheets. That is, normal adsorption of only one sheet and the judgment result of whether to be the lap adsorbed state of two or more sheets is outputted. The comparison operation for the judgment by the two-sheet adsorption judging means 5 may be performed by the difference in the amplitude, or may be calculated by the difference in vibration frequency. <BR> [0011] Since it is what

contacts vibration exciter 3 and the vibration measurement child 4 to Plate W in this way according to this two-sheet detection equipment 1, it is good at the contact only from an upper part side, and there is no problem of damage by fall of Plate W. Moreover, two-sheet detection can be performed only by not inserting a measurement means in the inferior surface of tongue of Plate W, therefore raising Plate W slightly from the loading location S, and the cycle time can be shortened, and the fall height of the plate W at the time of two-sheet adsorption can be made low.

[0012] Drawing 2 shows an example of sheet-metal-work Rhine which equipped this two-sheet detection equipment 1. Adsorption pad 2a of a large number which adsorb Plate W is superficially arranged in the rise-and-fall frame 14, and a loader 10 attaches it in it, and runs between the ingredient truck 11 of the loading location S of Plate W, and the plate processing machines 12 along with a rail 13. The rise-and-fall drive of the rise-and-fall frame 14 is enabled by the elevator style 15 of a pantograph type. The flapping equipment 16 which aims at separation in two-sheet adsorption is formed in this rise-and-fall frame 14 by making it go up and down a part of adsorption pad 2a, and carrying out flapping actuation of the plate W. Two-sheet detection equipment 1 is installed in the frame 17 which installed the rail 13 possible [ an attitude in the direction of arrow-head a ] with the attitude driving gear (not shown).

[0013] In this sheet-metal-work Rhine, when the plate W on the ingredient truck 11 is raised a little by adsorption pad 2a of a loader 10, two-sheet detection equipment 1 detects two-sheet adsorption. When it is proper one-sheet adsorption, the fixing disc material W is conveyed to the plate processing machine 12 with a loader 10. By carrying out flapping actuation with flapping equipment 16, in two-sheet adsorption, the plate W which adhered under the fixing disc material W is dropped, and it performs conveyance to the plate processing machine 12 after that.

[0014]

[Effect of the Invention] In order that the two-sheet detection equipment of the plate of this invention may prepare the vibration exciter and the vibration measurement child in contact with a plate, it is good at the contact only from an upper part side, and does not have the problem of damage by fall of a plate. Moreover, two-sheet detection can be performed only by not inserting a measurement means in the plate bottom, therefore raising a plate slightly from a loading location, and the cycle time can be shortened, and the fall height of the plate at the time of two-sheet adsorption can be made low.

## TECHNICAL FIELD

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[Industrial Application] This invention separates one plate of a laminating condition at a time, and relates to the two-sheet detection equipment of the plate applied to the loader carried in to the plate processing machine of a punch press or others.

## PRIOR ART

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[Description of the Prior Art] When separating at a time one plate by which the laminating was carried out to the stock location in automatic production systems, such as sheet-metal-work Rhine, and carrying in to a plate processing machine conventionally, the loader of an adsorption equation is used. In this loader, it conveys by adsorbing the top plate one by one with an adsorption pad, and raising. However, since the oil etc. has adhered to the front face for surface treatment or plates are carrying out field contact densely mutually, in case the plate by which the laminating was carried out raises the top

plate with an adsorption pad, it may be raised to [ both ] the plate under it. If even a plate processing machine conveys the plate of such a lap condition as it is, it will be in the middle of conveyance, and it not only causes the trouble on processing, but will produce the trouble of a plate falling.

[0003] Therefore, conventionally, two-sheet detection equipment is installed in a stock location, and detecting the number of sheets of the plate raised with the loader is performed. As this kind of two-sheet detection equipment, what is generally shown in drawing 3 is used. According to this, the raised plate W is clamped and put by the air cylinder 51 and the bottom clamp 52, thickness is measured with an analog sensor (not shown), and it judges whether they are being [ it / proper one sheet adsorption ] two adsorbed states as compared with the set point.

## EFFECT OF THE INVENTION

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[Effect of the Invention] In order that the two-sheet detection equipment of the plate of this invention may prepare the vibration exciter and the vibration measurement child in contact with a plate, it is good at the contact only from an upper part side, and does not have the problem of damage by fall of a plate. Moreover, two-sheet detection can be performed only by not inserting a measurement means in the plate bottom, therefore raising a plate slightly from a loading location, and the cycle time can be shortened, and the fall height of the plate at the time of two-sheet adsorption can be made low.

## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, in the thing of the configuration of drawing 3, as shown in this drawing (B), when the lower plate W falls at the time of the clamp of Plate W, a fall impact may act on the arm section 53 of the bottom clamp 52, and the arm section 53 may be damaged. Moreover, in what uses the bottom clamp 52 in this way, if Plate W is not raised to the height which can insert the bottom clamp 52, measurement cannot be started, and the cycle time does not become long. Furthermore, problems, like the fall height of the plate W at the time of two-sheet adsorption becomes high are also produced.

[0005] The purpose of this invention is offering the two-sheet detection equipment of a plate with which there being no problem of breakage by fall of a plate, and having raised the plate's slightly from the loading location can also detect.

## MEANS

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[Means for Solving the Problem] The two-sheet detection equipment of the plate of this invention is equipped with the vibration exciter which contacts the plate raised with the absorber from a top face, and gives vibration, and the vibration measurement child who contacts said plate from a top face in a different part from said contact location, and receives said vibration.

## OPERATION

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[Function] By measuring vibration given to the plate by vibration exciter by the vibration measurement child, whether two or more it is whether the number of plates is one can distinguish with the difference of a resonant frequency. That is, two-sheet detection can

be performed by becoming the value from which the amplitude and vibration frequency of vibration differed, and comparing this with the set point according to the difference of the resonant frequency of the vibration system of the adsorbed plate. Since each of vibration exciter and vibration measurement child makes the top face of a plate contact, even if a lower plate falls in two-sheet adsorption, they can detect only by injuring neither vibration exciter nor a vibration measurement child, and raising a plate slightly.

## EXAMPLE

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[Example] One example of this invention is explained based on drawing 1 . This two-sheet detection equipment 1 forms the vibration exciter 3 which contacts the plate W raised with the adsorber 2 from a top face, and gives vibration, and the vibration measurement child 4 who contacts Plate W from a top face in a different part from that contact location. vibration exciter 3 -- for example, electromagnetism -- a solenoid, the ultrasonic vibrator by the hydrostatic pressure cylinder and the piezoelectric device, etc. can be used. The vibration measurement child 4 can use the microphone which can measure the frequency range according to an excitation frequency.

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[0012] Drawing 2 shows an example of sheet-metal-work Rhine which equipped this two-sheet detection equipment 1. Adsorption pad 2a of a large number which adsorb Plate W is superficially arranged in the rise-and-fall frame 14, and a loader 10 attaches it in it, and runs between the ingredient truck 11 of the loading location S of Plate W, and the plate processing machines 12 along with a rail 13. The rise-and-fall drive of the rise-and-fall frame 14 is enabled by the elevator style 15 of a pantograph type. The flapping equipment 16 which aims at separation in two-sheet adsorption is formed in this rise-and-fall frame 14 by making it go up and down a part of adsorption pad 2a, and carrying out flapping actuation of the plate W. Two-sheet detection equipment 1 is installed in the frame 17 which installed the rail 13 possible [ an attitude in the direction of arrow-head a ] with the attitude driving gear (not shown).

[0013] In this sheet-metal-work Rhine, when the plate W on the ingredient truck 11 is raised a little by adsorption pad 2a of a loader 10, two-sheet detection equipment 1 detects two-sheet adsorption. When it is proper one-sheet adsorption, the fixing disc material W is conveyed to the plate processing machine 12 with a loader 10. By carrying out flapping actuation with flapping equipment 16, in two-sheet adsorption, the plate W which adhered under the fixing disc material W is dropped, and it performs conveyance to the plate processing machine 12 after that.

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the front view of the two-sheet detection equipment concerning one example of this invention.

[Drawing 2] It is the front view equipped with this two-sheet detection equipment of sheet-metal-work Rhine.

[Drawing 3] It is the explanatory view of the conventional example.

[Description of Notations]

1--2-sheet detection equipment, 2 [ -- A vibration measurement child, a 5--2-sheet adsorption judging means, 6 / -- A movable base, W / -- A plate, S / -- Loading location ]  
-- An absorber, 2a -- An adsorption pad, 3 -- Vibration exciter, 4